LAWRENCE LIVERMORE
REPORT

A weekly collection of scientific and technological achievements from Lawrence Livermore National Laboratory: April 6-April 12, 2010

A superheavy trip down the periodic table

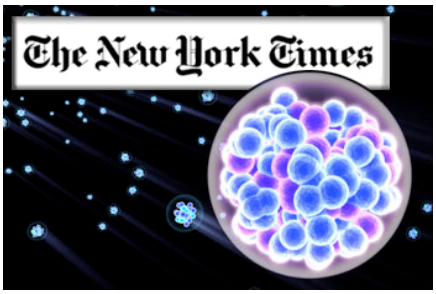


Illustration of the newly created element 117.

Livermore scientists in conjunction with a team of researchers from Russia, another Department of Energy national laboratory and two universities, have discovered the newest superheavy element, element 117.

The team included scientists from the Joint Institute of Nuclear Research (Dubna, Russia), the Research Institute for Advanced Reactors (Dimitrovgrad), Lawrence Livermore, Oak Ridge National Laboratory, Vanderbilt University and the University of Nevada, Las Vegas.

This discovery brings the total to six new elements discovered by the Dubna-Livermore team (113, 114, 115, 116, 117, and 118, the heaviest element to date).

The experiment produced six atoms of element 117. For each atom, the team observed the alpha decay from element 117 to 115 to 113 and so on until the nucleus fissioned, splitting into two lighter elements. In total, 11 new "neutron-rich" isotopes were produced, bringing researchers closer to the presumed "island of stability" of superheavy elements.

To read more, go to
http://www.nytimes.com/2010/04/07/science/07element.html?ref=science

Lab researcher aids in discovery of new species

Bones of *Australopithecus sediba* found in an area of South Africa.

The Lab's Dan Farber in collaboration with an international team has discovered fossils of a new species of hominid, *Australopithecus sediba,* thought to be at least 2 million years old in an area of South Africa known as the Cradle of Humankind.

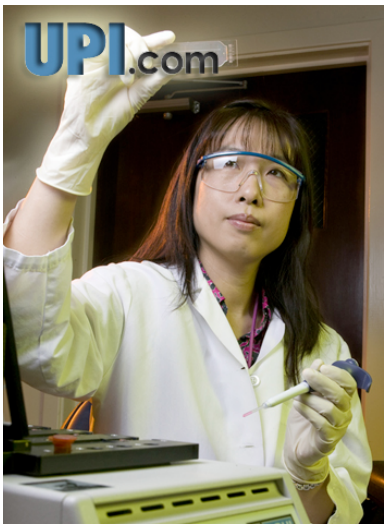
Farber's work involved describing the geological, geochronological, geomorphological and faunal context of the Malapa site -- which holds the fossils of an adult and a juvenile of the new species. The research appears in a pair of papers in the April 9 issue of the journal, *Science*.

Australopithecus is a genus of extinct hominids, made up of the gracile australopiths, and formerly also, the robust australopiths. The new fossils of *Au. sediba* reveal skeletons that are exceptionally well preserved, proving unique insight in the period when the earliest members of the genus *homo* evolved.

Using the Laboratory's Center for Accelerator Mass Spectrometry, Farber and a team of researchers were able to quantify the degree of post fossil landscape change. In other words, they were able to track the evolution of the landscape from where the fossils originally were deposited to where they were found in the present day. Using rare radioisotopes formed by the interaction of cosmic rays with rocks at the Earth's surface, Farber was able to provide a paleo-ruler by which he measured the amount of material lost since the time the fossil was deposited.

To read more, go to
http://www.popularmechanics.co.za/content/news/singlepage.asp?key=954

Vaccine's purity not always clean as a pig



Lab biologist Crystal Jaing holds up a Microbial Detection Array slide.

State-of-the-art Lab detection technology recently was used to conduct vaccine analyses that unexpectedly found the presence of a benign pig virus.

The research was aimed at using the latest technologies to show that live vaccines contain only the viral genomes and no others. However, in this case the scientists were surprised to find that a benign pig virus was found in a vaccine used to prevent diarrhea in babies.

Three Livermore researchers -- Crystal Jaing, Shea Gardner and Kevin McLoughlin -- used a new detection technology, the Microbial Detection Array, to check the results. With 388,000 probes that fit on a one-inch wide, three-inch long glass slide, the array can detect or identify any of the approximately 60,000 viruses or 2,500 bacteria worldwide that have been sequenced.

The Livermore researchers confirmed the presence of the pig virus DNA in the vaccine.

To read more, go to http://www.upi.com/Science_News/2010/04/08/New-technologies-may-hike-vaccine-safety/UPI-99281270748629/

Rock unsteady

The Lab's Dylan Rood collecting samples for 10Be surface exposure dating of an alluvial fan deposit.

Precariously balanced rocks have been found in places where they shouldn't stand a chance: All around the San Andreas Fault and along other faults as well.

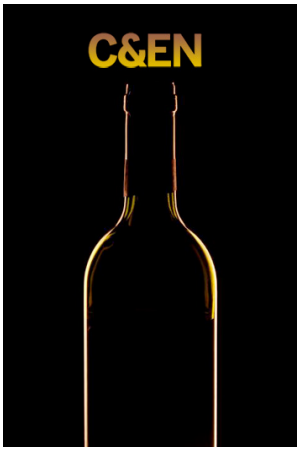
As for figuring out how long the rocks have been standing, that's a nut that Dylan Rood of Lawrence Livermore National Lab, has just cracked.

"What's most important about dating a precarious rock is dating when it became precarious," Rood explained.

One technique that he has used successfully is sampling minerals on the rocks for beryllium-10, which is created in quartz crystals when they are struck by cosmic rays. In other words, the longer a rock surface is exposed to the sky, the more cosmic rays the rock's minerals are exposed to and the more beryllium-10 they accumulate. To translate that beryllium-10 measurement into a date, Rood and his colleagues have developed a model that gives them a good idea what to expect for minerals of different ages.

To read more, go to http://news.discovery.com/earth/balanced-rocks-earthquake-hazard.html

How fine is your wine?



When you uncork a bottle of wine, do you ever wonder whether it contains what the label claims? Is it a Merlot or a Cabernet?

LLNL chemist Bruce Buchholz is using isotopic signatures characterized via accelerator mass spectrometry (AMS) to confirm the vintage of a wine.

Plants take up carbon from the atmosphere in the form of CO2. Although the level of 12C and 13C in the atmosphere is essentially constant, the amount of radiocarbon (14C) doubled between 1950 and 1963 as a result of nuclear weapons testing. The variation in 14C content from one year to the next is great enough that a wine produced from grapes grown in 1971 can be distinguished from wine made from grapes grown in 1972, he said.

Beyond wine, the AMS radiocarbon method can also be used to evaluate food claims regarding natural versus synthetic content, Buchholz said.

To read more, go to http://pubs.acs.org/cen/science/88/8814sci1.html

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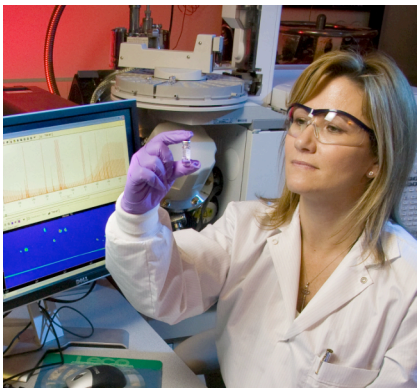
Photo of the week



As seen on CSI: At the Laboratory's Forensic Science Center, researcher Heather Mulcahy works with the EPA's environmental reference laboratory for developing and validating reliable, accurate, and extremely sensitive methods to analyze chemical warfare agents and their degradation products.

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance.

To send input to the Livermore Lab Report, send e-mail mailto:labreport@llnl.gov.

The *Livermore Lab Report* archive is available at:
https://publicaffairs.llnl.gov/news/lab_report/2010index.html